CHAPTER 1

INTRODUCTION

1.1 Introduction

In this chapter, it will introduce an overview of distance measurement system via visible light communication. The background of study, objectives and the scope of the project are explained in this chapter.

1.2 Background of Study

Wireless communications is the transmission of information without wires, cable or any electrical conductors over a distance and the transmitted distance can be reaching up to hundred metres. This wireless communication is the fastest growing segment in the communications technology industry where the cellular phone haves experience this aggressive evolution over the last decades starting from the first invented telephone by Alexander Graham Bell in 1876 (Goldsmith, 2005). The cellular phone is advance rapidly and become a business tools in the most developed countries and they compete to each other in order to deliver the performance needed to support emerging applications.

Besides, the wireless communication system is not only occurs to the cellular phone yet there are many devices that use wireless system such as satellite television, wireless computer and Wi-Fi. The benefits from this technology are that data or information can be transmitted faster and it reduces the cost for the maintenance and installation purpose. It is also become convenient because it can be use anywhere. There are various types of wireless communication which are satellite communication, broadcast radio,

microwave radio, Bluetooth, and infrared wireless communication that can be use to develop a new product in the future.

The next generation of wireless communication systems is expected to move ahead from being solely radio frequency to hybrid systems including optical wireless communication systems (Connor & York, n.d.). The visible light communication (VLC) is the optical wireless communication (OWC) that becoming an alternative choice for next generation wireless technology by offering low cost, unregulated bandwidth and ubiquitous infrastructures support (Sagotra & Aggarwal, 2013). Visible light is use for data transmission by modulating light in the visible spectrum (400-800 THz or 780–375 nm) that is particularly used for illumination. The VLC has experienced exponential growth with the growth of high power light emitting diode (LED) in the visible spectrum(Arnon, 2015). VLC systems take the advantage of the light emitting diodes (LEDs) which can be pulsed at very high speed without perceptible effect on the lighting output and human eye.

However, LED has dual functionality for illumination and communication which contributed to a sustainable and energy efficient approach (Uysal & Nouri, 2014). As light emitting diode (LED) is low in power consumption, minimal heat generation lighting and has a longer life-time compared to the fluorescent lamp system, many researchers are working on the development of light emitting diode (LED) (Komine & Nakagawa, 2004). The aim of this project is to investigate and develop a distance measurement system by using LED to produce a flat surface object with the support from the camera for image processing.

1.3 Problem Statement

There are various devices that use in distance measurement available in the market like ultrasonic, laser, capacitive sensors and others. Most of them give a very significant impact on process automation and factory automation parts of a product manufacturer. Today’s distance measurement sensors are used in varying applications for automated systems, robotics, and safety systems. Because of its various applications, the demand for the sensor is growing steadily from time to time.

However, there are also many methods use in distance measurement system in order to obtain the accurate values. Many researches have been made to produce a distance measurement system from low cost materials, and also the device is low power consumptions. LED is known for its advantages which comply with the characteristics that researcher demand compare with other light system such as fluorescent lamp system. Therefore, the purpose of this project is to develop a distance measurements sensor by transmitting light from light emitting diode (LED) to the flat surface object.

1.4 Objectives

The objectives of this project are:

- To develop a light meter for illumination level measurement using light dependent resistor (LDR).
- To implement a new method of object distance measurement by using light emitting diode (LED) and image processing approach.

1.5 Scope of Study

The main focus of this study is to measure a distance between a camera and an object with flat surface created from monochromatic light sources in a low illumination environment. This project actually utilizes the advantage of light emitting diode (LED) as illumination. Besides, LED is also low power consumption, long life and low temperature generation.

The project begins with calibration of illumination level using a light dependent resistor (LDR) against a commercial light meter in a specific built bench top enclosure. This is to determine the illumination level of the bench top enclosure that is suitable in distance measurement system. Next is the camera calibration against simulated illuminated surface with known distance. And lastly is assessment of the distance between a camera and an object with the object diameter size produce by light emits from LED.